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FROM: Robert H. Frantz
Franklin Gray Patents, LLC
Tel: 405-812-5613
Fax: 405-440-2465

DATE: October 12, 2005

PAGES: 19 (inclusive)

In re the Application of:

Viktors Berstis	)	
Serial Number: 10/015,880	)	Group: 2625
Docket Number: AUS920011011US1	)	Examiner: Sathyanaraya V. Perungavoor
Filed on: 12/13/2001	)	
For: "System and Method for Anti-Moiré Imaging in a One Dimensional Sensor Array"	)	

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FEE TRANSMITTAL for FY 2005

Effective 12/08/2004. Patent fees are subject to annual revision.

Complete if Known	
Application Number	10/015,880
Filing Date	12/13/2001
First Named Inventor	Viktors Berstis
Examiner Name	Sathyanaraya V. Perungavoor
Art Unit	2625
Attorney Docket No.	AUS920011011US1

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (*) $ 500.00

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): ____________

☒ Deposit Account:

Deposit Account Number: 09-0447 Deposit Account Name: IBM Corporation

The Director is authorized to: *(check all that apply)*

☒ Charge fee(s) indicated below
☒ Charge any additional fee(s) or any underpayment of fee(s) under 37 CFR 1.16 and 1.17
☐ Charge fee(s) indicated below, **except for the filing fee**
☒ Credit any overpayments

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

FEE CALCULATION

Application Type	Filing Fee ($)	Filing Small Entity Fee ($)	Search Fee ($)	Search Small Entity Fee ($)	Examination Fee ($)	Examination Small Entity Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

FEE DESCRIPTION

	Fee ($)	Small Entity Fee ($)
• Each claim over 20 or, for reissues, each claim over 20 and more than in the original patent	50	25
• Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
• Multiple dependent claims	360	180

Total Claims		Extra Claims		Fee($)		Fee Paid ($)
	- 20 or HP=		X	50	=	

HP = highest number of total claims paid for, if greater than 20

Multiple Dependent Claims Fee ($)	Fee Paid ($)
360 x	

Indep. Claims		Extra Claims		Fee($)		Fee Paid ($)
	- 3 or HP=		X	200	=	

HP = highest number of total claims paid for, if greater than 3

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41 (a)91)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof		Fee($)		Fee Paid ($)
	- 100 =		/50 =	(round up to a whole number)	X	250	=	

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee	
Other: Fee for filing a Brief in support of an Appeal (41.20(b)(2)	$500.00

SUBMITTED BY					
Name	Robert H. Frantz	Registration No.	42,553	Telephone	405-812-5613
Signature	Robert Frantz			Date	10/12/05

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In re the Application of:

Viktors Berstis)
Serial Number: 10/015,880)
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For: "System and Method for Anti-Moiré Imaging in a One Dimensional Sensor Array")

Group: 2625
Examiner: Sathyanaraya V. Perungavoor

APPEAL BRIEF

Real Party in Interest per 37 CFR §41.37(c)(1)(i)

The subject patent application is owned by International Business Machines Corporation of Armonk, NY.

Related Appeals and Interferences per 37 CFR §41.37(c)(1)(ii)

The present patent application is related to US Patent Application number 10/015,492, docket number AUS920011012US1, which is under appeal from final rejections. No decision from a court or the Board has been rendered in this related appeal.

Status of Claims per 37 CFR §41.37(c)(1)(iii)

Claims 1 - 4, 6 - 10, 12 - 17, and 19 - 21 were finally rejected in the Examiner's decision of May 16, 2005. Claims 5, 11 and 18 were canceled in a previous amendment.

The rejections of Claims 1 - 15 were appealed by Appellant on September 16, 2006.

Status of Amendments after Final Rejections per 37 CFR §41.37(c)(1)(iv)

No amendments to the claims have been submitted or entered after final rejections.

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Summary of the Claimed Subject Matter per 37 CFR §41.37(c)(1)(v)

The invention relates to devices and methods for producing sampled images, such as digital or digitized images, in a manner to avoid producing Moiré patterns. A one-dimensional sensor array is provided which has non-uniformly spaced sensors, which avoids production of an inherent "frequency" that may interfere or resonate with details or harmonics present in the image source. The sensors are placed along a one-dimensional axis in a non-uniform manner according to a predetermined scheme or function. During scanning, sensors are sampled according to the same or another non-uniform function in order to realize a similar non-uniform sampling scheme in a second dimension. Finally, linear interpolation is applied to the non-uniformly spaced data set to yield a synthesized uniformly-spaced data set for use in common imaging formats and processing, such as JPEG or MPEG compression and decompression.

More specifically, we have claimed method, computer-readable medium and system embodiments of the invention in independent claims 1, 10 and 15, respectively as follows:

(a) a plurality of sensor positions provided or disposed in a row (e.g. one-dimensional) arrangement (fig. 5) non-uniformly distributed with varying distances (fig. 5 $d_{n-1 \text{ to } N}$, Abstract pg. 23 lines 10 - 11,) between each adjacent pair of sensor positions determined according to a first predictable (pg. 10 line 20; pg. 11 lines 1, 8, 9; pg. 15 line 14) deterministic (pg. 10 line 13; pg. 11 lines 5 and 19; pg. 13 lines 7 and 18) schema (pg. 9 lines 12 - pg. 11 line 18); and

(b) selectively sampling an image by sequentially exposing portions of the image to the row of sensors according to a second predictable (pg. 15 line 14) deterministic (pg. 15 line 20) schema (pg. 15 lines 3 - 13), such that each sensor position is sampled in a non-uniformly varying spatial manner to obtain a first set of data samples representing non-uniformly spaced points in the image (pg. 9, lines 2 - 14, *et seq.*).

An advantage to our invention is that the use of a predictable deterministic function to calculate the position of a sensor in one or two axes allows for an image data set (e.g. the actual data samples in a JPEG or bitmap file) to be properly interpreted by a recipient without the need

for any look up tables (pg. 11 lines 4 - 5) to be associated with the image or complicated image processing functions, only requiring the knowledge of the actual distribution function parameters and a seed value (e.g. CRC parameters and values) (pg. 6 line 19 through pg. 7 line 4).

Grounds for Rejection For Which Review is Sought per 37 CFR §41.37(c)(1)(vi)

Appellant requests review by the Board of:

(a) rejections of claims 2 - 4, 6 - 8, 12, 13, 19 and 20 under 35 USC §112 for insufficient antecedent basis for claim limitation of "predictable deterministic";

(b) rejections of claims 9 and 14 under 35 USC §112, first paragraph, for failing to provide written description of the linear interpolation process producing approximately the same number of data samples as the original sample data set;

(c) rejections of claims 1 - 4, 6 - 9, 10, 12 - 17, and 19 - 21 under 35 U.S.C. 103(a) as being unpatentable over U.S. patent 4,574,311 to Resnikoff, *et al.* (hereinafter "Resnikoff") in view of publication "LFSR counters implement binary polynomial generators" by Balph (hereinafter Balph).

Arguments per 37 CFR §41.37(c)(1)(vii)

Rejections of 2 - 4, 6 - 8, 12, 13, 19 and 20 under 35 USC §112

In the Office Action, it appears that claims 2 - 4, 6 - 8, 12, 13, 19 and 20 were rejected under 35 USC §112 for insufficient antecedent basis for the claim limitation of "predictable deterministic", which was introduced in the previous applicant's amendment to distinguish terminology between a probabilistic function and a deterministic function. The term "predictable" was include to further strengthen the interpretation of the claim limitation that we were claiming a non-probabilistic function for positioning the sensors on the row.

In the remarks accompanying the amendment, Appellant clearly established that the conventional definitions of "probabilistic" and "deterministic" were contrasting antonyms, and established that Appellant's disclosure of a predictable non-linear function was a deterministic, not probabilistic, function:

> **deterministic**
>
> 1. <probability> Describes a system whose time evolution can be **predicted** exactly. Contrast **probabilistic**.
>
> 2. <algorithm> Describes an algorithm in which the correct next step depends only on the

current state. This contrasts with an algorithm involving backtracking where at each point there may be several possible actions and no way to chose between them except by trying each one and backtracking if it fails.
(source http://www.dictionary.com, emphasis added):

Additionally, Appellant's disclosure clearly specified that the function claimed to *determine* (pg. 10 line 20; pg. 11 lines 1, 8, 9; pg. 15 line 14) the position offset of a sensor relative to an adjacent pixel in the sensor row is a *predictable* function (pg. 10 line 13; pg. 11 lines 5 and 19; pg. 13 lines 7 and 18), and similarly that the function for determining (pg. 15 line 20) the second-axis sample position (e.g. the stepper motor position in the y-axis) is also a *predictable* function (pg. 15 line 14).

It must also be born in mind when considering the meaning of these terms that the mathematical antonym of deterministic, which is probabilistic, cannot be used to determine an exact value, but instead to determine the probability or likelihood of a value (e.g. the likelihood of a position of a sensor).

As such, antecedent basis for the term "predictable deterministic" found in applicant's disclosure, and especially when taken in conjunction with customary definitions employed by those skilled in the art, is sufficient to support the claimed limitation. Appellant requests reversal of the rejections of claims 2 - 4, 6 - 8, 12, 13, 19 and 20 under 35 USC §112.

Rejections of Claims 9 and 14 under 35 USC §112, First and Second Paragraphs

In the Office Action, claims 9 and 14 were rejected under 35 USC §112, first and second paragraphs, for failing to provide written description of, and for failing to point out and distinctly claim the linear interpolation process which produces approximately the same number of data samples as the original sample data set.

With regard to the term "approximately" rendering a claim indefinite, this holding is not supported by the examples provided in MPEP 706.03(d), wherein "such as", "or the like", and "for example" are specifically cited. Further, a search of the USPTO text-searchable database of US patents issued since 1976 using the search command "ACLM/approximately" yields 183,826 patents which contain the term "approximately" in their claims.

Clearly, at least under some circumstances, claims containing the term "approximately" are definite. We have employed the term in its conventional sense:

> **approximately**
> *adv* : (of quantities) imprecise but fairly close to correct; "lasted approximately an hour"; "in just about a minute"; "he's about 30 years old"; "I've had about all I can stand"; "we meet about once a month"; "some forty people came"; "weighs around a hundred pounds"; "roughly $3,000"; "holds 3 gallons, more or less"; "20 or so people were at the party" [syn: about, close to, just about, some, roughly, more or less, around, or so]
> (source: www.dictionary.com)

In Appellant's disclosure, it was disclosed that an array of non-uniformly spaced data samples consisting of **N** columns and **M** rows is processed to yield one interpolated data sample between each pair of adjacent samples in each row and in each column. (pg. 15 line 7 to pg. 16 line 7). An example interpolation process of using the distances from the new (e.g. uniformly spaced) position to the pixel positions just to left and right of the new value was provided (pg. 15 lines 9 - 21). Such a process produces an array of evenly spaced data samples for columns 1 to **N**, and rows 1 to **M**.

It logically follows, however, that this does not mean necessarily that the yielded evenly spaced data sample set consists of **N • M** samples total. For example, following the disclosed approach of interpolating new points *between* each non-uniformly space data sample pair (pg. 15 line 8), there could be determined a new point between columns 1 and 2, columns 2 and 3, ..., and between columns **N** - 1 and **N**. But, it could be implemented to stop at this point because there is no pixel column **N** + 1. So, the process would yield **N** - 1 columns of data. Similarly, the process would yield **M**-1 rows of data, thus producing an array of (**N**-1) • (**M**-1).

In another embodiment, an ordinarily skilled person in the art could implement the invention within the scope of the disclosure to simply use the last row and column data in the non-uniformly spaced data set for the uniformly spaced data set (a common way of terminating or starting an interpolation process). This would yield a uniformly spaced data sample array of size **N • M** .

In yet another embodiment, an ordinarily skilled person in the art could implement the invention within the scope of the disclosure to extrapolate the values for the first and last rows

and columns of data in the uniformly spaced data set (also a common way of terminating or starting an interpolation process). This would yield a uniformly spaced data sample array of size $(N+1)\bullet(M+1)$.

Thus, using common techniques well known in the art for interpolation and extrapolation, the invention may be realized to generate evenly spaced data sample sets of sizes:

$$(N-1)\bullet(M-1) \leq N\bullet M \leq (N+1)\bullet(M+1),$$

or, in other words, *approximately* the same size as the non-uniformly spaced data set of $N\bullet M$, differing in each dimension (row or column) by one.

For these reasons, the use of the term "approximately" is not indefinite, and the claiming of producing a uniformly spaced data set having a size approximate to that of the non-uniformly spaced data set is consistent with, and is fully supported by Appellant's disclosure. Appellant requests reversal of the rejections of claims 9 and 14 under 35 U.S.C. §112, first and second paragraphs.

Rejections of Claims 1 - 4, 6 - 9, 10, 12 - 17, and 19 - 21 Resnikoff in View of Balph

In the rationale for the final rejections of Claims 1 - 4, 6 - 9, 10, 12 - 17, and 19 - 21 Resnikoff in view of Balph, it was reasoned that Resnikoff's disclosure of a "Poisson disc process" is a distribution schema which can be applied to one- or two-dimension sampling techniques. It was reasoned that Resnikoff does not teach that the schema is "predictable deterministic" as we have claimed.

It was reasoned that Balph's teaching of a non-linear counter based on a set of feedback shift registers was such a predictable deterministic schema, and it was postulated that Balph's disclosed object of reducing logic would have been the motivation by one of ordinary skill in the to replace Resnikoff's Poisson disc process with Balph's non-linear counter. Appellant respectfully disagrees.

References Are Not In Same Field of Endeavor. It was reasoned in the rejections that Balph and Resnikoff's invention belong to the same field of endeavor. Balph's non-linear counter is a deterministic process, while Resnikoff's Poisson disc process is a probabilistic process (e.g. Poisson distribution is well known in the art of probability and statistics). No

citation has been made by examiner from Resnikoff wherein Resnikoff suggests replacing their probabilistic function with a deterministic function. Resnikoff does disclose a look up table, but one in which the data points are generated using a probabilistic function, and thus the schema using the table generates sensor positioning which is related to probability, not determinism.

No Suggestion or Motivation Found; Misinterpretation of Balph's Object. A question that remains is whether or not Balph provides the motivation to combine as proposed in the rationale for the rejection. Balph's invention is directed toward "binary counters":

> You can use linear-feedback shift registers (LFSRs) **as alternatives to conventional bi-nary counters** (Reference 1). (Balph, page 1, col. 1, first line, emphasis added)

This is the extent of suggestion by Balph, to use LFSRs in place of binary counters. The next sentence in Balph's disclosure has been argued to provide the motivation to use Balph's alternative to binary counters in place of Resnikoff's Poisson probability schema:

> An LFSR reduces the amount of required logic and minimizes routing complexity. (Balph, page 1, col. 1, second sentence, emphasis added)

Balph's suggestion regarding logic minimization at this point in the reference applies to minimizing the logic of *traditional binary counter designs*. There is no suggestion or reason to believe that Balph is stating that use of an LFSR would decrease the logic complexity of a look up table or Poisson probability function. In fact, Balph's disclosure is silent as to application of LFSR's to probabilistic applications, and certainly Balph's remaining disclosure is non-enabling for that purpose.

Balph suggests that their LFSR can also be used as a pseudo-random number generator, but this is a well known use which we have also noted in our disclosure, although we referred to such a logical structure as a CRC polonomial:

> These generators find **common use** for pseudorandom-number generation. (Balph, pg. 1, col. 1, fifth sentence, emphasis added).

Balph's counter alternative produces number in a sequential manner in which no number is repeated twice until each and every other possible number has been produced in sequence, as any good counter circuit should do:

> Through simulation, you can observe the count sequence and verify that the selected polynomial repeats after 2n-1 states ... and that no state repeats within each sequence. (Balph, col. 3, lines 12 -15).

This type of even distribution of numbers in a sequence is known as a "uniform" distribution:

> **uniform distribution (continuous)**
> In mathematics, the continuous uniform distributions are probability distributions such that all intervals of the same length are equally probable. ...
>
> **uniform distribution (discrete)**
> In probability theory and statistics, the discrete uniform distribution is a discrete probability distribution that can be characterized by saying that all values of a finite set of possible values are equally probable. ...
>
> (Source: www.wikipedia.com)

However, Resnikoff specifies use of a pseudo-random generator which produces numbers with a Poisson distribution:

> ... The term "pseudo-random" is used because, while the distribution of the sensor elements in the array is random, **the distribution is arrived at by using specific algorithms to be disclosed hereinafter**. In this description, the terms "pseudo-random" and "random" are used interchangeably. ... (Resnikoff, col. 4, lines 26 - 31, emphasis added).
>
> ...
>
> A method of manufacturing the sensing device of this invention comprises the steps of randomly generating a series of numbers corresponding to the coordinates of points on the substrate relative to a fixed position until the number of points corresponds to a desired sampling rate. The barycenter of each sensor element is then located at one of these points, and the areas of the sensor elements selected to provide isolation of each element from its adjacent elements. To provide uniform response, the areas of the sensor elements must be substantially equal to each other. This method produces an array of sensors on the substrate **having a Poisson distribution**. (Resnikoff, col. 4 line 67 to col. 5 line 11, emphasis added).

Hence, Resnikoff's "specific algorithm" involves use of the "barycenter" of the sensors, and achieves a *Poisson* distribution. There are known in the art pseudo-random generator processes which achieve other distributions, such as Uniform, Gaussian, Exponential, LaPlace, Weibull, Cauchy, Raleigh, Lognormal, Gumbel, Bernoulli, Geometric, Binomial, etc., but Resnikoff specifies Poisson.

As Balph is silent as to the use or adaption of their counter circuit for use in generating random numbers having a Poisson distribution, and as Resnikoff clearly specifies use of a random Poisson schema, there can be no motivation to combine the references as proposed in the rationale for the rejections for the following reasons:

(a) uniform and Poisson distributions are not the same;

(b) replacing Resnikoff's Poisson distribution function with a uniform distribution function may render Resnikoff undesirable for it's intended

function;

(c) Resnikoff in view of Balph fails to teachs all of our claimed steps, elements, and limitations.

Confusion should be avoided when considering when and how the terms uniform and non-uniform are used in our disclosure and in the references. In one use, the term is being used to describe the distribution of numbers, such as our CRC process and Balph's counter, which generate random numbers with a uniform distribution. We then use these numbers as *offsets* from uniformly spaced points on a physical row for the placement of sensors, thus giving us an array of sensors having non-uniform spacing (e.g. randomized), but in which the offset values from uniform points on the array are uniformly distributed.

Resnikoff, however, applies a Poisson (e.g. non-uniform) distribution function to achieve a physical sensor row having a randomized positioning arrangement, but their underlying offset values from uniformly spaced points on the array will have a Poisson distribution, not a uniform distribution.

For these reasons, Appellant requests reversal of the rejections of claims 1 - 4, 6 - 9, 10, 12 - 17, and 19 - 21.

Summary of Arguments

For the foregoing reasons, it is submitted that the rejections of Claims 1 - 4, 6 - 10, 12 - 17, and 19 - 21 were erroneous, and Appellant requests reversal of the rejections.

Respectfully Submitted,

Robert Frantz

Agent for Appellant(s)
Robert H. Frantz, Reg. No. 42,553
Tel: (405) 812-5613

Franklin Gray Patents, LLC
P.O. Box 23324
Oklahoma City, OK 73127
Tel: 405-812-5613
Fax: 405-440-2465

Claims Appendix

per 37 CFR §41.37(c)(1)(viii)

Clean Form of Amended Claims

Claim 1 (previously amended):

A method of producing a sampled image comprising the steps of:

providing a plurality of sensor positions in a row arrangement non-uniformly distributed with varying distances between each adjacent pair of sensor positions determined according to a first predictable deterministic schema; and

selectively sampling an image by sequentially exposing image portions to said row arrangement according to a second predictable deterministic schema such that each sensor position is sampled in a non-uniformly varying spatial manner to obtain a first set of data samples representing non-uniformly spaced points in said image.

Claim 2 (original):

The method as set forth in Claim 1 wherein said first predetermined schema comprises a pseudo-random schema.

Claim 3 (original):

The method as set forth in Claim 1 wherein said first predetermined schema comprises a nonlinear polynomial schema.

Claim 4 (original):

The method as set forth in Claim 1 further comprising the step of assigning a reference identifier to said first predetermined schema.

Claim 5 (previously canceled).

Claim 6 (previously amended):

The method as set forth in Claim 1 wherein said second predetermined schema comprises a pseudo-random schema.

Claim 7 (previously amended):

The method as set forth in Claim 1 wherein said second predetermined schema comprises a nonlinear polynomial schema.

Claim 8 (previously amended):

The method as set forth in Claim 1 further comprising the step of assigning a reference identifier to said first predetermined schema.

Claim 9 (previously amended):

The method as set forth in Claim 1 further comprising the step of interpolating a set of data samples representing uniformly spaced data samples from said first set of non-uniformly spaced data samples, wherein said uniformly spaced data samples represent said image and contain approximately the same number of data samples as said first set of non-uniformly spaced data samples.

Claim 10 (previously amended):

A computer readable medium encoded with software for producing a sampled image, said software causing a processor to perform the steps of:

sequentially exposing image portions to a plurality of sensors positioned in a row arrangement non-uniformly distributed with varying distances between each adjacent pair of sensor positions determined according to a first predictable deterministic schema; and

selectively sampling said sensors according to a second predictable deterministic schema such that each sensor is sampled in a non-uniformly varying spatial manner to obtain a first set of data samples representing non-uniformly spaces points in said image.

Claim 11 (previously canceled).

Claim 12 (previously amended):

The computer readable medium as set forth in Claim 10 wherein said predetermined schema comprises a pseudo-random schema.

Claim 13 (previously amended):

The computer readable medium as set forth in Claim 10 wherein said predetermined schema comprises a nonlinear polynomial schema.

Claim 14 (previously amended):

The computer readable medium as set forth in Claim 10 further comprising software for interpolating a set of data samples representing uniformly spaced data samples from said first set of non-uniformly spaced data samples, wherein said uniformly spaced data samples represent said image and contain approximately the same number of data samples as said first set of non-uniformly spaced data samples.

Claim 15 (previously amended):

A system for producing a sampled image comprising:

a plurality of sensors positioned in a row arrangement distributed with varying distances between each adjacent pair of sensor determined according to a first predictable deterministic schema; and

a means for selectively sampling an image by sequentially exposing image portions to said row arrangement according to a second predictable deterministic schema such that each sensor position is sampled in a non-uniformly varying spatial manner to obtain a first set of data samples representing non-uniformly spaces points in said image.

Claim 16 (original):

The system as set forth in Claim 15 wherein said first schema for sensor positioning is a pseudo-random schema.

Claim 17 (original):

The system as set forth in Claim 15 wherein said first schema for sensor positioning is a nonlinear polynomial schema.

Claim 18 (previously canceled).

Claim 19 (previously amended):

The system as set forth in Claim 15 wherein said second predetermined schema comprises a pseudo-random schema.

Claim 20 (previously amended):

The system as set forth in Claim 15 wherein said second predetermined schema comprises a nonlinear polynomial schema.

Claim 21 (original):

The system as set forth in Claim 15 further comprising a means for generating a uniformly-spaced data sample by interpolating said first set of data samples.

Evidence Appendix

per 37 CFR §41.37(c)(1)(ix)

No evidence has been submitted by applicant or examiner pursuant to 37 CFR §§1.130, 1.131, or 1.132.

Related Proceedings Appendix

per 37 CFR §41.37(c)(1)(x)

No decisions have been rendered by a court or the Board in the related proceedings as identified under 37 CFR §41.37(c)(1)(ii).